Art. XI.—*Contributions to the Palaeontology of the Older Tertiary of Victoria.*

Lamellibranchs.—Part III.

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(With Plates XII., XIII., XIV. and XV).

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The present paper includes a number of species that it has been found necessary to diagnose, as the majority are undoubtedly new, but some have been included under described species which I shall endeavour to show are quite distinct from them.

The following are the species included:—

Lithophagus latecaudatus, sp. nov.
Mytilus mooraboolensis, sp. nov.
Glycimeris halli, sp. nov.
    var. intermedius, var. nov.
    var. paucicostatus, var. nov.
Trigonia semiundulata, Jenkins.
    var. granosa, var. nov.
    var. lutosa, var. nov.
Crassatellites maudensis, sp. nov.
Crassatellites kingicoloides, sp. nov.
Crassatellites camurus, sp. nov.
Mytilicardia kalimnae, sp. nov.
Cardita excrescens, sp. nov.
Lucina gunyoungensis, sp. nov.
Chione etheridgei, sp. nov.
Chione cognata, sp. nov.

Many of the species are particularly interesting, as their occurrences tend materially to strengthen the views held by Mr. T. S. Hall and myself on the stratigraphical relationships of some of our Tertiary beds.

Lithophagus latecaudatus, sp. nov. (Pl. XIV., Fig. 4).

Description.—Shell smooth, thin and fragile, digitiform, narrow and tumid at the anterior end, but remarkably broad and depressed at the posterior end, the posterior being more than twice as broad as the anterior. Umbo incurved anteriorly and depressed dorsally. Anterior end very short, but strongly convexly rounded, ventral margin sloping downwards to the posterior; dorsum immediately behind the umbo slightly concave, thence ascending to the posterior, posterior margin broadly convex. Surface smooth and shining, showing faint irregular undulations or ridges conforming to the lines of growth, and very faint finer parallel striations, very close radial striations may also be detected, particularly on the upturn towards the post-dorsal margin forming a microscopic reticulation. The nacreous interior shows where the shells are decorticated or worn, especially on the umbonal region.

Dimensions.—Antero-posterior diameter, 42 mm.; width at umbo, 11 mm.; median width, 17 mm.; greatest posterior width, 22 mm.; thickness through one valve, about 6 mm.

Locality.—Lower beds of the Spring Creek series, or Bird Rock Bluff, near Geelong. Jan Jukian,—Eocene.

Observations.—The genus Lithodomus has previously been recorded from "casts and crypts" in a coral from the Miocene beds of Hallett's Cove, by Professor R. Tate[1] in 1885, but the species was not described till 1886,[2] under the name of L. brevis. The present species is evidently distinct from the above-mentioned representative as judged by the dimensions and the few brief particulars given.

Mytilus mooraboolensis, sp. nov. (Plate XIV., Fig. 1).

Description.—Shell small, elongately triangular, umbo somewhat twisted, incurved, and terminal, strongly keeled from the umbo to the posterior margin, posterior area much expanded and depressed, sculpture on the anterior portion of the shell strongly marked off, and distinct from that on the posterior.

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1 Trans. Roy. Soc. South Australia, 1886, vol. viii., Lam., pt. i., p. 124.

2 *Op. cit.*, 1887, vol. ix., Lam., pt. ii., p. 186 (45 in author's reprint).

Ventral side flattened, and nearly straight, making an abrupt ascent to the umbonal keel. Umbo to posterior convex, becoming flattened towards the posterior margin, the depression being so marked towards the dorsal margin as to appear slightly concave. Dorsal margin straight, and making an angle of about 100 degrees with the slightly concave posterior, thence angled again, and nearly straight to join the ventral margin. Surface posterior to the umbonal keel sculptured by strong broad dichotomising ribs, numbering about eight at the umbo, and increasing to twelve or fourteen at the margin; on the flattened area below the keel the ribbing is of a much finer and more regular character, there being about twelve flat ribs, with much narrower interspaces on the hinder half of this area, while the forward half is still finer in its ribbing, and the ribs are more arched towards the umbo, instead of running up briefly to the keel. The shell also shows strong irregular concentric growth stoppages, which are inclined to frill the ribs at their intersection, finer concentric lines of growth are also present. Left valve furnished with a relatively strong tooth just below the beak, and a strong pad within for the anterior adductor.

Dimensions.—Type, length 19 mm.; extreme breadth, 12 mm.: breadth at posterior end, 7 mm.; others have a length of 14 mm. by a breadth of 7 mm., and some have length 12 mm. by breadth 7 mm.

Localities.—Lower beds of the Spring Creek series, or Bird Rock Bluff, near Geelong. Lower limestone beds of the Maude section, Moorabool Valley. Jan Jukian,—Eocene.

Observations.—This species at once recalls our living species M. menkeanus, Philippi, but is a much smaller and less solid species, with a more marked keel, and characteristic post-dorsal depression, different outline, and a more twisted umbo. It is equally distinct from the Miocene species, M. submenkeanus, Tate, from Hallett's Cove.

Glycimeris halli, sp. nov. (Pl. XIV., Figs. 10, 11, 12; Pl. XV., Figs. 1, 2, 8, 9).

Description.—Shell orbicular, tumid, thick and strong, equilateral, with a prominent convex umbo, and closely radially

ribbed surface. Umbo incurved and overhanging the ligamental area, which is a well-defined isosceles triangular space, the base of which is just about half the width of the hinge. Hinge furnished with from 22 to 26 oblique and angular teeth, most usually 12 on each side, with a tendency for the medial ones to become obsolete in the extreme adult. Surface closely covered with broad radial ribs, ranging from about 30 to 35 in small specimens, up to about 50 in the adult, ribs slightly convex, with very narrow, almost lineal, interspaces in young shells, but in the adult the ribs are decidedly flattened; the ribs are closely, finely, and regularly radially striate, each rib bearing near the ventral margin ten striae, anteriorly and posteriorly the ribs become obsolete, but the radial striae are present, and much stronger than on the ribs. The radial sculpture is crossed by fine concentric lines of growth. Interior of valves strongly denticulate along the ventral margin, bearing about 25 strong denticles, running about 8 to 10 in 10 mm., thence both anteriorly and posteriorly diminishing in size, but extending right up to the hinge.

Variety, **intermedius**, var. nov. (Pl. XIV., Figs, 10, 11).

A variation of the above shows a less orbicular outline with sloping shoulders and consequently an apparently more prominent umbonal region, and with coaser radial ribbing, 25 to 28 being about the average number.

Variety, **paucicostatus**, var. nov. (Pl. XIV., Fig. 12, and Pl. XV., Fig. 9.

Another form which appears but a variation of the above species, is intermediate in shape between it and the foregoing variety, but rather closer related to the latter, being distinguished most readily by the still coarser radial ribbing, as it bears only about 20 strong, convex ribs, neglecting the obscure and ill-defined ones on the anterior and posterior slopes.

Dimensions.—Type, antero-posterior diameter, 42 mm.; umbo-ventral diameter, 44 mm.; thickness through one valve, 18 mm. Others range from 24 by 22, 21 by 20, 18 by 17, 17 by 16, 12 by 11, to 9 by 9 and 8 by 8, and smaller. Var. intermedius, antero-posterior diameter, 21 mm., umbo-ventral diameter, 20 mm.,

and 19 by 19. Var. paucicostatus, antero-posterior diameter, 22 mm.; umbo-ventral diameter, 21 mm.; others range about 18 by 17, and 15 by 14·5.

Localities.—Grange Burn, between Forsyth's and Henty's, from the clays and sandy beds of the upper series; Muddy Creek, from the upper beds below the State School; sandy clays of Jimmy's Point, Gippsland, variety paucicostata seems fairly common at this locality. Kalimnan,—Miocene.

Observations.—This species has usually been confused with Pectunculus cainozoicus, T. Woods, but Mr. T. S. Hall was the first to draw my attention to the fact that it was distinct. The type locality for P. cainozoicus is Table Cape, and compared with specimens from that locality, our present forms are much thicker and stronger, more convex, with coarser radial ribbing, but much finer radial striations. Here again, as regards the genus, it appears we must lose another old friend in Pectunculus, for, according to Professor Tate and others, *Axinaea* should replace it, but, according to Dall, *Glycimeris* appears to have the best claims.

Trigonia semiundulata, Jenkins. (Plate XV., Figs. 3–7).

This species is a well known and characteristic form, described by McCoy as from Bird Rock Bluff, and the specimens described and figured by Mr. Jenkins are indicated by McCoy as having been forwarded by him to an exhibition in London, and therefore presumably from the same locality. This Bird Rock Bluff or Spring Creek form is very consistent in shape and in the closeness of the undulating anterior ridges. McCoy describes the undulating ridges as being "crossed, except on the anterior portion, by rather faint impressed sulci radiating from the beak to the ventral margin, nearly the same distance apart as the ridges of the posterior slope." This faint impression of the sulci is not a constant feature; in some few specimens it is so extremely faint as to be scarcely visible for a greater distance than half the umbo-ventral diameter of the shell, and then only close to the posterior radiation, whilst in others the impression is so deep as to break up the undulating ridges into triangular nodes for about a third of the antero-posterior diameter. From the latter form it

seems to me that we can proceed to an extreme form, for which it seems advisable to propose at least a varietal name.

Variety, **granosa**, var. nov. (Pl. XV., Fig. 5).

In shape similar to T. semiundulata, but proportionately a little shorter in its antero-posterior diameter, with eight distinct radial ribs on the posterior slope and three fainter spinose beginnings post-dorsally, anteriorly the undulating ridges are completely broken up into triangular nodes right up to the anterior margin, and so deeply impressed are the sulci that the shell has rather the appearance of being radially nodosely ribbed here also, there being 18 radiations on this portion, while looking at it from the point of view of undulations the number is about 25, and further apart than in the usual type, hence the granules or nodes are rather coarser than those usually developed.

Dimensions. — Antero-posterior diameter, 25 mm.; umbo-ventral diameter, 23 mm.; thickness through one valve, 7 mm.

Locality.—Lower beds of the Spring Creek series or Bird Rock Bluff, near Geelong. Jan Jukian,—Eocene.

Variety, **lutosa**, var. nov. (Pl. XV., Figs. 6, 7).

The next form for consideration is that commonly occurring at Muddy Creek, which is a very distinct variation from the typical form of the species. The shell is more oblong owing to a greater posterior attenuation, and is much narrower at the posterior end, the posterior area is more depressed, and the anterior area is rather more tumid and more regularly convex; the anterior undulations are coarser, less numerous, more regular, and do not ascend so rapidly; while the radial sulci are usually very faint, sometimes almost absent, or showing somewhat as a fimbriation of the ventral aspect of the concentric undulations, occasionally distinct on the upper half of the shell, and then very closely packed, considerably closer than in T. undulata, and then also apparently restricted to portion of the ventral slope and the interspace between the undulations.

Dimensions.—Antero-posterior diameter, 40 mm.; umbo-ventral diameter, 33 mm.; length of posterior, 22 mm. Other specimens range about 38 by 31·5 by 20; 36 by 30 by 18; 35 by

30 by 17; 34 by 30 by 18; 33 by 28 by 18, for the above measurements respectively.

Locality.—Lower beds of Muddy Creek, Western Victoria. Balcombian,—Eocene.

Observations.—Mr. R. Etheridge, jun.,[1] in his paper on a representative of this species from a depth of about six hundred and forty-seven feet from the Arumpo bore, east of the Darling, in the County of Wentworth, New South Wales, draws attention to some important points in some Muddy Creek examples of this species which he examined, and remarks on some discrepancies with McCoy's description. It must be borne in mind, however, that McCoy figured and described his specimens from the Spring Creek section. McCoy speaks of "faint impressed sulci radiating from the beak to the ventral margin," and it would be difficult to otherwise describe the Spring Creek forms. Etheridge, however, states, "but in the specimens examined by me, these are not sulci, nor are they continuous, but rather a fimbriation of the lower margin of each concentric ruga, and these being placed directly under and above one another in line, give rise to the appearance of sulci, until closely examined." This offers rather good independent confirmation of my treatment of the above, and so strengthens the case that the Muddy Creek examples might almost be regarded as a distinct species, but for the present a varietal distinction appears to me to meet requirements. The Arumpo bore specimen, judging from Mr. Etheridge's particulars, would appear to represent the Spring Creek form.

The Table Cape specimens represent the typical Spring Creek form.

From Wilkinson's No. 4 locality, Aire Costal sections, the specimens are of the Spring Creek type.

From Lake Bullen Merri, near Camperdown, the specimens are of the Muddy Creek type, var. lutosa.

Crassatellites maudensis, sp. nov. (Pl. XIV., Figs. 2, 3).

Description.—Shell elongate, oblong ovate, somewhat depressed, and bearing a strong angulation from the umbo to the post-ventral margin, the posterior area thus marked off being much

[1] Records Geo. Surv. N.S.W., vol. iii., pt. iv., p. 117, 1893.

flattened, and being devoid of the strong corrugations characteristic of the remainder of the shell.

Anterior margin convexly rounded, ventral margin slightly convex to almost straight, posterior truncation strongly marked, and post-dorsal margin usually very straight, sometimes slightly concave. Umbos strong and very acute and well incurved. Lunule long, narrow, and somewhat impressed. Surface closely set with very fine concentric lines of growth, most distinct on the posterior slope and towards the anterior of the shell, the median portion being occupied by strong concentric corrugations. Umbo very closely and regularly corrugate, in 3 mm. from the beak there are 14 corrugations, the corrugations here extending also on to the posterior slope; from the umbonal region towards the ventral margin the corrugations become broader, with shallow interspaces, flattening and thinning out towards both the anterior and posterior. Hinge teeth large and strong for the size of the shell, with a large deep cartilage or resilium pit, inner margin of the valves smooth.

Dimensions.—Type, antero-posterior diameter, 56 mm.; umbo-ventral diameter, 36 mm.; an example of the paired valves measuring 55 by 33 gave a thickness through both valves of 25 mm. Other examples range 60 by 36, 58 by 36, 59 by 35, 52 by 32, 47 by 30, and 39 by 25.

Localities.—Lower and Middle beds of the Spring Creek series, or Bird Rock Bluff, near Geelong; Lower beds at Maude, Moorabool Valley. Jan Jukian,—Eocene.

Observations.—This is a well-marked and distinctive species which shows some relationship to C. dennanti, Tate. Its characters are usually fairly constant, but some specimens are so straight along the ventral margin as to intensify the posterior angulation to a marked degree, and in some again the concentric corrugations are more persistent towards and up to the anterior end.

Crassatellites kingicoloides, sp. nov. (Pl. XIII., Figs. 1, 2, 3).

Description.—Shell large, strong and solid, broadly ovate, with prominent and large umbos, and rather a strongly marked and

rapid attenuation posteriorly, rather inflated in the neighbourhood of the umbos but becoming depressed ventrally and posteriorly.

Umbo-post-ventral keel not always well defined, but when present, concavely curved to the posterior margin, sometimes an intermediate faint keel shows between the posterior depression for the ligament and the umbo-ventral keel. Post-dorsal margin deeply concave to a short straight posterior truncation, thence regularly convex to the anterior and thence somewhat straight to the umbo. Umbos strong and very tumid, to flat and depressed at the crest, incurved anteriorly, and strongly but not very closely corrugated, the first 4 millimetres of the beak bearing from 9 to 11 corrugations. Lunule very large, deep and broad, being in length nearly one-half the umbo-ventral diameter; posterior to the beaks deeply and broadly excavated.

Surface covered with fine, close, but irregular concentric lines of growth very closely packed anteriorly and posteriorly, about one-third of the shell from the umbo regularly concentrically corrugated with narrow ridges, and broader and shallow interspaces; the remainder of the shell is usually devoid of regular corrugations, but frequently shows irregular concentric undulations. Hinge very thick and solid, and with teeth strongly developed. Inner margin of the valves smooth and bevelled off to a sharp edge. Internally the shell is relatively shallow and of small capacity.

Dimensions.—Type specimen, antero-posterior diameter, 69 mm.; umbo-ventral diameter, 54 mm.; thickness through both valves, 36 mm.; the slight variation from this may be indicated by the following specimens—67 mm. by 53 mm., and 66 mm. by 53 mm.

Locality.—Jimmy's Point, Kalimna, Gippsland Lakes. Kalimnan,—Miocene.

Observations.—This is a fairly common and well-preserved species from the above locality, and at once recalls the living C. kingicola, Lamarck; it may, however, be distinguished by its greater inflation, its marked posterior attenuation, its shorter anterior, its umbos much nearer the anterior, and the closer and more numerous umbonal corrugations. Compared with C.

oblonga, T. Woods, from the Eocene beds of Table Cape, Tasmania, it may be noted that T. Woods' species is proportionately longer and of much more uniform breadth, is a more depressed shell with a more incurved umbo, and still finer and closer umbonal corrugations, numbering (15) fifteen in the first 4 millimetres of the beak. With the recent species there is also another analogy of some interest, in that a species of Myochama is not infrequently found adherent to the shell, the present fossil species has Myochama plana, Tate, adherent to it.

Crassatellites camurus, sp. nov. (Plate XIV., Figs. 5–9).

Description.—Shell ovate, thick and solid, of medium size, with a very short anterior, and a somewhat attenuate posterior; strong, broad, and prominent umbos medially depressed. Slightly concave anterior to the beaks, slightly to deeply concave posterior to the beaks, ventral margin very slightly convex, medial portion usually straight. Umbos strongly incurved and rather coarsely corrugated, the first 4 millimetres of the beak bearing from 8 to 10 corrugations, the umbonal region rapidly broadens and becomes depressed. Umbo-post-ventral keel only moderately developed and convexly rounded.

The surface shows fine but irregular concentric lines of growth, with occasional irregular undulations, from a little less than half the umbo-ventral diameter of the shell to about one-third of the same the more regular corrugations make their appearance, and here they are about a millimetre apart, with broad shallow interspaces. Internal edge of shell smooth and bevelled off sharp. Young examples of this species are rather more wedge-shaped posteriorly than in the adult.

Dimensions.—Type specimens, left valve, antero-posterior diameter, 54 mm.; umbo-ventral diameter, 41 mm.; depth through the one valve, 14 mm.; right valve, antero-posterior diameter, 55 mm.; umbo-ventral diameter, 37 mm.; depth, 12 mm. The following antero-posterior and umbo-ventral diameters will serve to indicate the usual range and average variations:—64 by 42; 61 by 43; 60 by 40; 54 by 37; 52 by 36; 31 by 21; 25 by 18; 21 by 16; 13 by 10.

Localities.—Grange Burn, between Forsyth's and Henty's, and

Muddy Creek, near the State School, Western Victoria. Kalimnan,—Miocene.

Observations.—As I have previously indicated,[1] this species was regarded by Professor Tate as C. oblonga, T. Woods, but that conclusion I could not agree with when dealing with a collection of Table Cape fossils. Since then I have been able to examine the type of T. Woods' species in the Hobart Museum, and to collect a large series of specimens from the type locality, and I think there can be very little doubt about the utility of regarding our Victorian form as a distinct species. C. camurus may be distinguished from C. oblonga by its different outline, more striking umbo, by not being so generally depressed, and not so flattened at the crest of the incurvature of the beak, being more attenuate posteriorly, and by possessing a more coarsely corrugated beak; there are 8 to 10 corrugations in the first 4 millimetres in the former, as against at least 15 in the latter.

Mytilicardia kalimnae, sp. nov. (Plate XII., Fig. 4).

Description.—Shell thin, almost elliptical in outline, and rather depressed, so that from the internal aspect it appears shallow, externally strongly radiately ribbed, the ribs bearing erect scales. Faintly concave anterior to the beak, showing an extremely narrow but elongated lunule, anterior end convexly rounded and well-developed, post-dorsal margin ascends only a little, thence to the extreme posterior, convexly curved rather than truncated, and from the extreme posterior to the ventral margin more sharply curved, the greater part of the margin undulatory on account of the protrusion of the radial ribs.

Surface bearing 19 radiate ribs, with deep interspaces of about the same width; the ribs on the posterior slope are furnished with distant (that is from 1.5 to 2 mm. apart) erect hollow scales or spines, while on the anterior of the shell the scales are packed much more closely, and appear rather as a granulation or irregular oblong beading; ribs also radiately striate, and both interspaces and ribs transversely crossed by lines of growth. Internally strongly denticulate, and owing to the thinness of the shell it is internally grooved, corresponding to the external ribbing.

[1] P.R.S. Vic., vol. viii., n.s., p. 131.

Dimensions.—Antero-posterior diameter, 19 mm.; greatest breadth, 12·5 mm.; umbo-ventral diameter, 11 mm.; thickness through one valve, about 4 mm.

Locality.—Jimmy's Point, Kalimna, Gippsland Lakes. Kalimnan,—Miocene.

Cardita excrescens, sp. nov. (Pl. XII., Figs. 2, 3).

Description.—Shell large, thick and strong, rotund, with a remarkably prominent umbonal region, and bearing coarse radial costae, which are granulosely ornate.

Anterior side extremely short, slightly concave anterior to the umbo, with a relatively small lunule; post dorsal slope long and faintly convex, remainder of the margin regularly rounded. Umbo strong and incurved anteriorly, and rising high so as to give a strong hump to the shell.

Surface sculptured by 19 strong radial ribs, with broader interspaces, except at the ventral margin; both ribs and interspaces increasing in breadth towards the ventral margin; at the medial portion of the ventral margin the distance from centre to centre of two adjoining ribs being (2) two millimetres; the ribs bear a rather strong beading, the beads are irregularly sized, but run about eight in 5 millimetres, becoming more crowded anteriorly, towards the ventral margin for about the last 5 millimetres the beads are replaced by closer imbricating frills. Concentric lamellae show in the interspaces corresponding to the lines of growth, most prominently seen towards the anterior and posterior portions of the shell. Inner margin undulatory and coarsely denticulate, the teeth corresponding to the interspaces.

Dimensions.—Antero-posterior diameter, 21 mm.; umbo-ventral diameter, 22 mm.; thickness through one valve, about 9 mm.

Locality.—Shores of Lake Bullen Merri, near Camperdown. Balcombian,—Eocene.

Lucina gunyoungensis, sp. nov. (Pl. XIV., Fig. 13).

Description.—Shell small, thin, orbicular to quadrately orbicular, somewhat depressed, with a prominent pointed beak, greatest convexity of shell in the umbonal half, thence ventrally rather flattened.

Umbo acute, incurved a little to the front of the medial line, with a very small, deep, but relatively broad, cordate lunule, and further down two faint curved grooves radiating from the umbo to the anterior margin ; shell much depressed anterior to the lunule and inclined to shouldering or angulation at the downward curve of the anterior margin ; dorsal margin straight, downwardly inclined, and somewhat angulate with the posterior margin ; a change in the convex curvature of the ventral margin can be noted from that of the anterior and posterior margins, and this, together with the shouldering, gives rise to the quadrate appearance of the shell.

Surface sculptured by fine close concentric ridges which tend to become lamellose anteriorly and posteriorly, numbering about 20 in 5 millimetres from the ventral margin in average sized specimens, but running closer and finer towards the umbo. No radial sculpture present externally, but internally there is a faint radial striation terminating at the margin in faint crenulations.

Dimensions.—Type specimen, antero-posterior diameter, 13 mm. ; umbo-ventral diameter, 12 mm. ; others range from 12 mm. by 11 mm., 12·5 mm. by 12 mm. to 14·5 mm. by 14·5 mm. ; thickness through both valves of specimen 12·5 by 12 is 6 mm.

Localities.—Grey clays of Grice's Creek or Gunyoung Creek, Mornington. Balcombian,—Eocene. Lower beds of the Spring Creek series or Bird Rock Bluff, near Geelong. Jan Jukian,—Eocene.

Observations.—This species is apparently most closely related to L. leucomomorpha, Tate, but is more depressed, with the umbos more anterior, more deeply excavated anterior to the umbos, and differently sculptured.

Chione etheridgei, sp. nov. (Plate XII., Fig. 1).

Description.—Shell large, transversely oval, thick, and only moderately convex ; greatest convexity near the umbo, and with a marked flattening towards the ventral margin ; deeply concavely excavated anterior to the umbo.

Umbo very prominent, incurved anteriorly, and situated about one-third the length of the shell from the anterior margin. Lunule distinct, elongate cordate, and slightly raised to a medial ridge along the junction of the valves. Dorsally immediately

posterior to the umbo the ligamental groove is long and narrow, and is margined by a much more elongate but relatively broad, smooth, flattened, or slightly concave area, which is well defined from the remainder of the shell by an angulation running from the umbo to the posterior margin. The post-dorsal margin is slightly arched, and joins the posterior margin somewhat suddenly; the junction is usually convexly rounded, but occasionally a distinct angulation is noticeable giving rise to a posterior truncation.

Ventral margin regularly and gently convexly rounded to the more strongly convex anterior margin. The surface of the valves is strongly marked by closely packed radial ridges, which are broader than the interspaces umbonally, but the latter become as broad at the ventral margin; the radial ridges show a tendency to subdivision by a minor radial groove, and this is more especially noticeable on the anterior half of the shell; concentric lines of growth are also present and in conformity with some of these, are thin erect frills which are corrugated on their ventral aspect, the ridge on the frill corresponding in position to the interspaces between the radial ridges. The frills become more crowded towards the ventral margin. Inner margin denticulated, anterior denticles at first very fine, gradually increasing in size to the anterior portion of the ventral margin, then along the median portion finer and fairly regular, thence to the posterior a few very strong ones, then gradually fading away.

Dimensions.—Type shell, antero-posterior diameter, 65 mm.; umbo-ventral diameter, 51 mm.; greatest thickness through one valve about 18 mm. Other specimens range 65 mm. by 52 mm.; 63 by 49, 56 by 46, 53 by 42, 52 by 45, and a smaller specimen with both valves in contact gives 44 by 35 and a thickness through both valves of 24 mm.

Locality.—Lower beds of the Spring Creek series or Bird Rock Bluff, near Geelong. Jan Jukian,—Eocene.

Observations.—Two species of this genus of a very similar type of shell have already been described by Professor Tate, namely—C. hormophora, and C. dimorphophylla. The former, however, is of different shape, is strongly inflated, and shows many distinctive features in the surface sculpture; the description

of the latter is of the most meagre order, and but for possessing well authenticated examples of the species, it would be difficult to be certain on many points, but by actual comparison the following points may be noted:—C. dimorphophylla is more regularly tumid and not depressed as in the present new species, and shows a marked posterior truncation, and a shorter anterior end, the umbos being much further forward, and the radial ribbing is of a much closer and finer character.

This type of shell is also represented amongst living Australian mollusca, and the species that appears most closely related is C. laqueata, Sowerby, which can be obtained living from the Paramatta River, New South Wales, right up along the Queensland coast. This living species is, however, a strongly inflated and rather coarsely ornate form, as compared with our fossil species.

Chione cognata, sp. nov. (Pl. XII., Fig. 5).

Description.—Shell large, thick, and solid, broadly ovate, regularly convex but not strikingly tumid, with a shallow but broad lunule, and not deeply concave anterior to the umbo.

Umbo broad and strong, incurved anteriorly, and situated about one-fourth the length of the shell from the anterior margin. Anterior margin for the length of the lunule straight, thence to and along the ventral margin regularly convex to the posterior, where the shell shows an evident truncation from the post-dorsal region, dorsal margin gently arched to the posterior truncation. The ligamental groove is deep and very long, being about one-half the length of the shell, and is margined by a broad, but concave dorsal area which only shows lines of growth.

The surface of the valves is crowded with very close and fine radial riblets, which are broader than the interspaces, the riblets thicken somewhat towards the ventral margin but still remain broader than the interspaces; the radial sculpture is crossed by very fine lines of growth, and by strong regular concentric frills, the frills at first are thin and delicate and usually the bases only are preserved, but towards the ventral margin they become very thick and strong ridges medially, tapering to thinner crenulated frills towards the anterior and posterior of the shell, the concentric frills taking up the character of the radial sculpture

are distinctly corrugated on both their dorsal and ventral aspects, ridges corresponding in position to the radial riblets, and where the frills have become broad strong ridges, they show a corrugation on their upper flat surface as well.

Inner margin finely denticulated, in some well-preserved examples the denticles commence under the umbo and extend to the top of the posterior angulation.

Dimensions.—Antero-posterior diameter, 68 mm.; umbo-ventral diameter, 53 mm.

Locality.—Grange Burn, below Forsyth's, Western Victoria (T. S. Hall and G. B. P.). Kalimnan,—Miocene.

Observations.—This species is another of similar type to the foregoing but may be distinguished by its greater inflation, relative dimensions, and detailed characters of surface ornament.

EXPLANATION OF PLATES.

Plate XII.

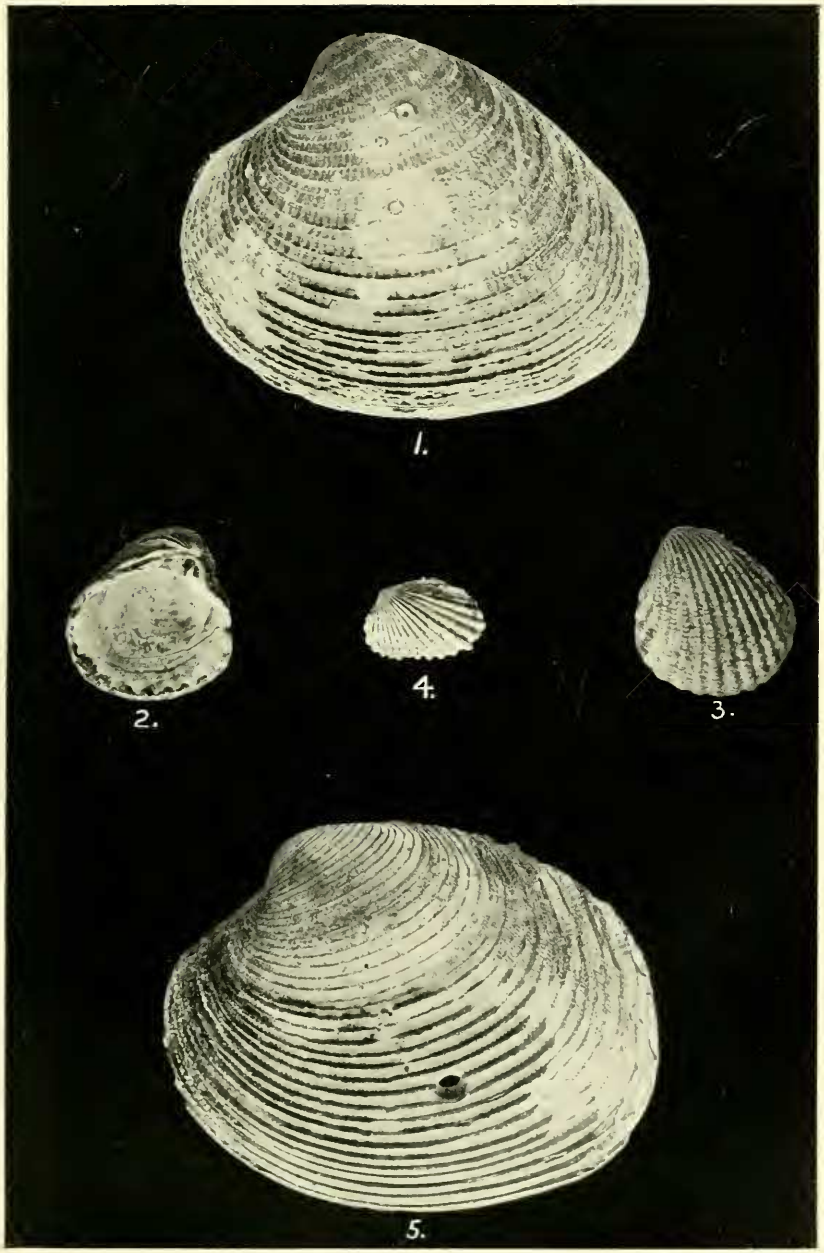
Fig. 1.—Chione etheridgei, sp. nov.
,, 2.—Cardita excrescens, sp. nov., internal aspect.
,, 3.—Cardita excrescens, sp. nov., external aspect.
,, 4.—Mytilicardia kalimnae, sp. nov., slightly reduced.
,, 5.—Chione cognata, sp. nov.

Plate XIII.

Fig. 1.—Crassatellites kingicoloides, sp. nov., external aspect.
,, 2.—Crassatellites kingicoloides, sp. nov., anterior aspect.
,, 3.—Crassatellites kingicoloides, sp. nov., dorsal aspect.

Plate XIV.

Fig. 1.—Mytilus mooraboolensis, sp. nov.
,, 2.—Crassatellites maudensis, sp. nov.
,, 3.—Crassatellites maudensis, sp. nov.
,, 4.—Lithophagus latecaudatus, sp. nov.
,, 5.—Crassatellites camurus, sp. nov., left valve, adult.
,, 6.—Crassatellites camurus, sp. nov., right valve, adult.
,, 7.—Crassatellites camurus, sp. nov., left valve, young, showing umbonal characters.



D. W. Paterson, Photo.